3.3.9 Weather - Drought and Effects of Drought

Drought originates from a deficiency of precipitation over an extended period of time, usually a season or more. This deficiency results in a water or soil moisture shortage for some activity, group, or environmental sector. Drought is a normal, recurrent feature of climate, although many erroneously consider it a rare and random event. It occurs in virtually all climatic zones, but its characteristics vary significantly from one region to another.

3.3.9.1 Background

Drought is usually considered relative to some long-term average condition of balance between precipitation and evapo-transpiration perceived as "normal". Drought is related to the timing (i.e., principal season of occurrence, delays in the start of the rainy season, occurrence of rains in relation to principal crop growth stages) and the effectiveness (i.e., rainfall intensity, number of rainfall events) of the rains.

The effects of drought become apparent with a longer duration because more and more moisture-related activities are affected. Agriculturally, non-irrigated croplands are most susceptible to moisture shortages. Rangeland and irrigated agricultural lands do not feel the effects of drought as quickly as the non-irrigated, cultivated acreage, but their yields can also be greatly reduced due to drought. Reductions in yields due to moisture shortages are often aggravated by wind-induced soil erosion.

Photo 3.3.9-1
Sand Dunes during 2002 Drought in Eastern Montana Source: Montana NRIS (2004)

In periods of severe drought, plant and forest fuel moisture is very low, increasing the potential for devastating wildland and rangeland fires. The most recent extreme fire seasons in 1988, 2000, and 2003 all coincided with sustained drought periods. Under extreme drought conditions, lakes, reservoirs, and rivers can be subject to severe water shortages, impacting irrigation, drinking water, fish populations, and fire suppression water supplies.

An additional hazard resulting from drought conditions is insect infestation. In the Northern Great Plains, rangeland grasshopper outbreaks have caused significant damage to the agricultural economy. Grasshopper populations tend to increase with both livestock grazing rates and dry conditions, and they can double, triple, or quadruple with each successive year of drought.

During a severe grasshopper outbreak, grasshoppers often remove more vegetation than cattle in the same pasture. Of the 400 species of grasshoppers in the Western United States, only about two dozen species are actually considered pest species capable of causing significant economic damage and a few species are even considered beneficial because they eat weeds. Grasshoppers are important to the grassland ecology, offering a primary food source for many grassland birds (NDMC, 2004; Branson, 2002).

Photo 3.3.9-2 The Lesser Migratory Grasshopper is the most Common Pest Species in the Western United States
Source: Branson, 2002

3.3.9.2 History of Drought and Effects of Drought in Montana

Our perspective of drought and its historic impact on Montana extends back about 100 years. A longer look at the history of climate for the region provides a little better perspective on how the most recent droughts and drought in the 1930s compare. Some of the research suggests the recent drought conditions were minor compared to drought modes that existed prior to 1200 A.D. Paleoclimate research indicates that regular and persistent droughts existed and were specifically pronounced during the years of A.D. 200-370, A.D. 700-850, and A.D. 1000-1200. These were long, sustained dry periods and made the period from A.D. 1200 to the present appear relatively wet (Laird and others, 1996).

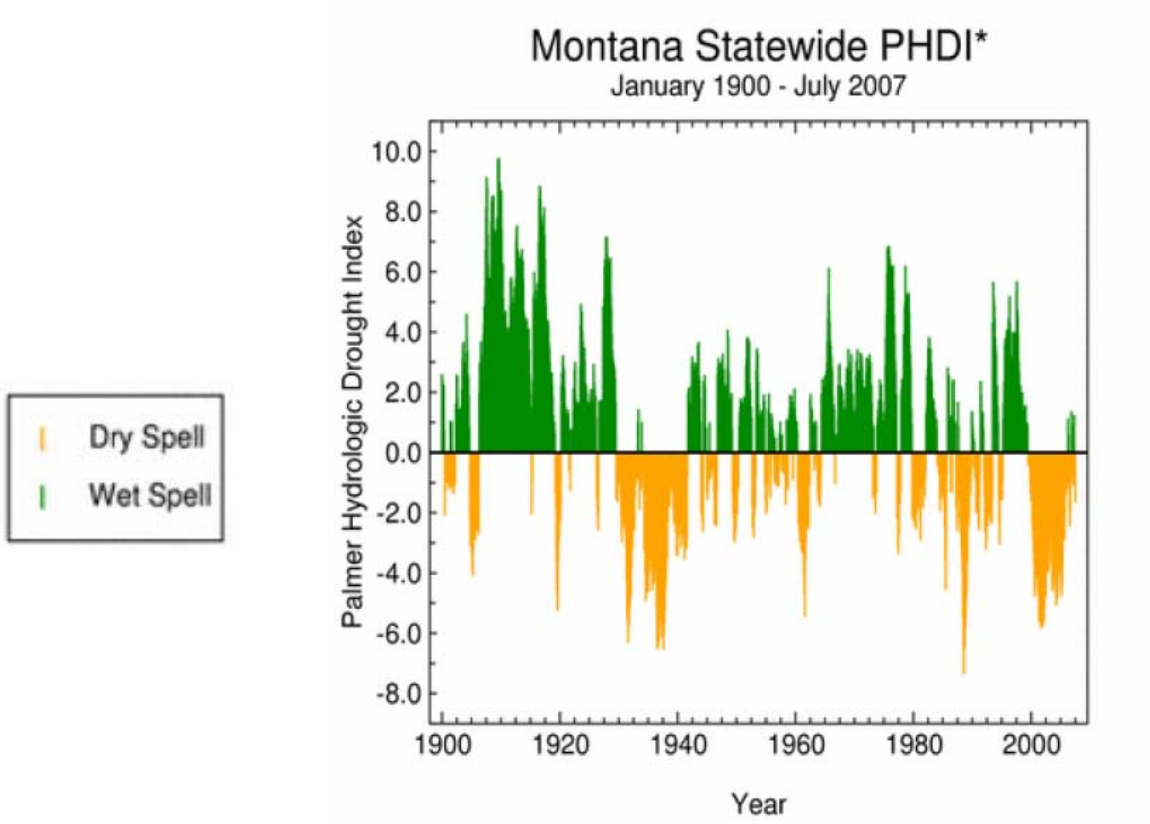
A closer focus into the more recent paleoclimate, using tree rings to identify dry periods, shows a much wetter period in the United States over the past 300 years. NOAA researchers reconstructed Palmer Drought Severity Indexes from tree-ring data and found that historic droughts, similar to severity and duration of drought during the 1950s, occurred once or twice a century for the past three centuries in the United States (1860s, 1820s, 1730s). The research also showed that there has not been another drought as extensive and prolonged as the 1930s drought in the past 300 years (NOAA, 2003).

In the last 100 years, the first experiences of drought impacts occurred shortly after homesteaders flooded the state. The homestead boom of 1906 through 1918 "busted" when severe drought swept the state from 1917 through 1923. The drought was compounded by plummeting market prices and banks demanding repayments. The out-washing exodus of demoralized homesteaders proved even more rapid than the previous in-coming wave of optimistic settlers. Of the estimated 100,000 immigrants who flooded into the state (1906-1918), 65,000 departed between the armistice of World War I (1918) and

about 1925. The homestead collapse, among other forces, propelled Montana into a depression from which it did not recover until World War II (Montana Historical Society, 2004).

Already reeling from the 1919 drought and agricultural disaster, the Dust Bowl years further impacted agricultural production and economies throughout the state. The period from 1928 through 1939 was the driest in the historic record. The Palmer Hydrologic Drought Index (PHDI) showed the entire state was in a hydrologic deficit for over 10 years. Other sustained dry periods include the middle 1950s, early 1960s, mid-1970s, and the 1980s (**Figure 3.3.9-1**). The most-recent drought from 2000-2007, suggests the dryness and hydrologic deficit mimics the Dust Bowl years in everything but duration.

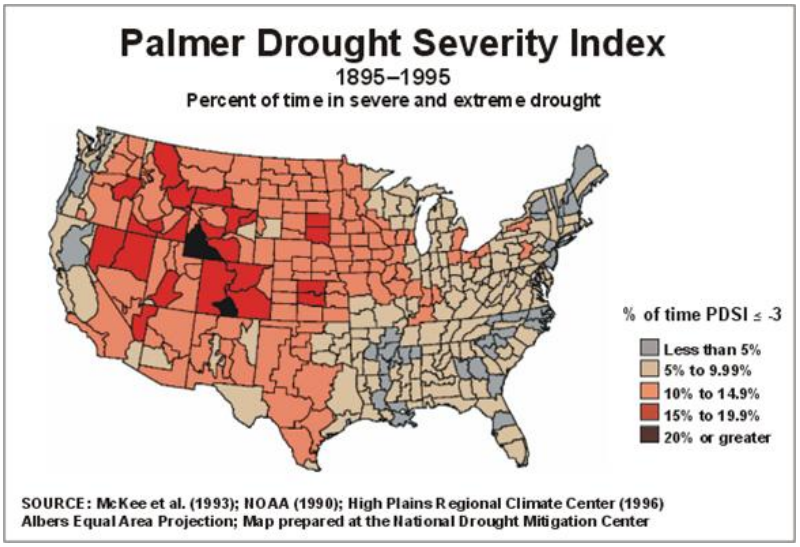
Figure 3.3.9-1 Palmer Hydrologic Drought Index 1900-2007
(Source: NCDC, 2007)



Many areas in the western U.S. have experienced drought. According to the PHDI, Montana has been in severe and extreme drought between 10 and 20 percent in the time in the last one hundred years (**Figure 3.3.9-2**).

Extreme high temperatures, low humidities, wind, rainfall, and snowpack can all contribute to drought conditions. Montana's weather extremes can be a factor in compounding an existing drought problem. In Glendive on July 20, 1893 and in Medicine Lake on July 5, 1937, the temperature reached 117°F. During 1960, the community of Belfry only received 2.97 inches of precipitation, another Montana extreme. Although Montana is typically known for its extreme winter weather, summertime extremes can also have an impact.

Figure 3.3.9-2 Percent of Time in Severe or Extreme Drought over 100 Years (1895-1995)



Drought and other agricultural disaster declarations in Montana from 1930-2003 are summarized in **Table 3.3.9-1.** Although damage information is incomplete, this table helps illustrate that the four years of drought from 2000-2004 has been one of the most costly in the past 30 years.

Table 3.3.9-1 Montana Drought and other Agricultural Disasters

Date	Event	Damages
1930-1938	Dust Bowl	
1938	Grasshopper Infestation affecting 17 counties with populations "between 40 and 500 hoppers per square yard".	$6,500,000
1956	20 counties applied for Federal disaster aid due to reduced precipitation	
1961	17 counties requested designation as federal disaster areas due to lack of moisture, higher than normal temperatures, and grasshopper infestation.	
August 1961	24 counties applied for federal drought disaster aid.	Federal: $420,000
1966	Below-normal precipitation for a 10-month period recorded in 10 weather stations across the state.	
August 1975	Grasshopper Infestation, Valley County. Up to 110-120 hoppers per square yard in hay fields. 40,000 acres sprayed.	State: $60,000 Local: $60,000
May 1977	Soil damaged by winds in western and southern part of state over a 7-month period.	250,000 acres of farmland damaged
June 1977	Hydroelectric water supplies critical; Governor Judge issued an energy supply alert and ordered 10% reduction in electricity use by state and local governments.	
1980	Record-low precipitation in eastern Montana since 1979. In Richland County alone, 600 of the county's 800 farmers had applied for federal payments for drought. Grasshopper infestations in isolated areas, little wheat planted, large numbers of livestock sold due to hay and water shortages.	Est. economic loss: $380,000,000
1981	Drought starting in 1979 continued. March snow pack 50-60% of normal	
1984	By July, many High-Line cities experiencing water shortages and rationing schedules put into effect. Numerous forest and range fires.	Est. crop losses: $12,000,000 to $15,000,0000

Table 3.3.9-1 Montana Drought and other Agricultural Disasters

Date	Event	Damages
1985	All 56 counties received disaster declarations for drought during this year. From 1982 to 1985, cattle herds reduced by 1/3. Smallest wheat crop in 45 years. Extended effects of drought: loss of off-farm jobs, closing of implement dealerships and Production Credit Associations.	Est. economic loss: $3,000,000,000
June 1986	Grasshopper Infestation. Carter, Daniels, Golden Valley, Petroleum, Richland, Roosevelt, Sheridan, Treasure & Wibaux counties.	State: $350,000 Local: $350,000
June 1992	Drought Emergency (EO 13-92). All areas of the state, suspend certain regulatory authorities relating to the issuance of beneficial water use permits by DNRC because of drought.	
June 1992	Drought Disaster (EO 14-92). All areas of the state, continue the suspension of certain regulatory authorities relating to the issuance of beneficial water use permits by DNRC because of drought.	
October 1992	Terminating drought disaster (EO 20-92). Executive Order terminating the declaration of disaster ordered in EO 14-92.	
August 1994	Drought emergencies were declared in a number of Montana counties with 83% of the State reported under drought conditions at mid-month. Stress to stream fisheries (low water levels, high temp.); crop yields, wildfires.	
2000	Severe drought and persistent heat causing significant losses to agriculture and related industries	$4.2 billion in damage/costs and 140 deaths nationwide
2000-2002	The U.S. Department of Agriculture (USDA) issued Natural Disaster Determinations (NDD) for drought for the entire state of Montana for the years 2000, 2001, and 2002. This designation entitled counties to low interest loans for producers, small business administration loans, and an Internal Revenue Service provision deferring capital gains.	
2003	The USDA issued NDD for drought for 35 counties in Montana on December 3, 2003. This designation makes Montana farmers and ranchers eligible for USDA Farm Service Agency (FSA) emergency farm loans if they have losses caused by drought in the 2003 crop year.	$154,012,122 paid by FSA in Montana
2004	The USDA issued NDD for drought for 20 counties in Montana on April 23, 2004. This designation makes Montana farmers and ranchers eligible for USDA Farm Service Agency (FSA) emergency farm loans if they have losses caused by drought in the 2004 crop year.	

Sources: MDES, 1998, 2004 and 2007; NOAA, 2004; NCDC, 2004; US SBA, 2004.

Current drought conditions have drawn comparisons to drought in 1930s during the Great Depression and Dust Bowl period. In Montana, the Dust Bowl period lasted about 11 years, 1930-40 (inclusive). Below-normal precipitation was experienced during nearly every year of the Dust Bowl. Additionally, the 1930s were warmer than normal, which, again, exhibits some similarities to our current climate.

At some selected sites around the state, the NWS added up the amount of "lost" precipitation during the 11 year period, 1930-40, as compared to our current 30 year annual normal precipitation (**Figure 3.3.9-3**). Similarly, the NWS examined the "lost" precipitation from 1999 to 2003. For those years, the precipitation deficit is shown in **Figure 3.3.9-4**. **Figure 3.3.9-5** shows precipitation departure from normal for the State from 1996 to 2003.

Figure 3.3.9-3 Precipitation anomalies during 11 years of the Dust Bowl (1930-1940) Source: NWS, 2004

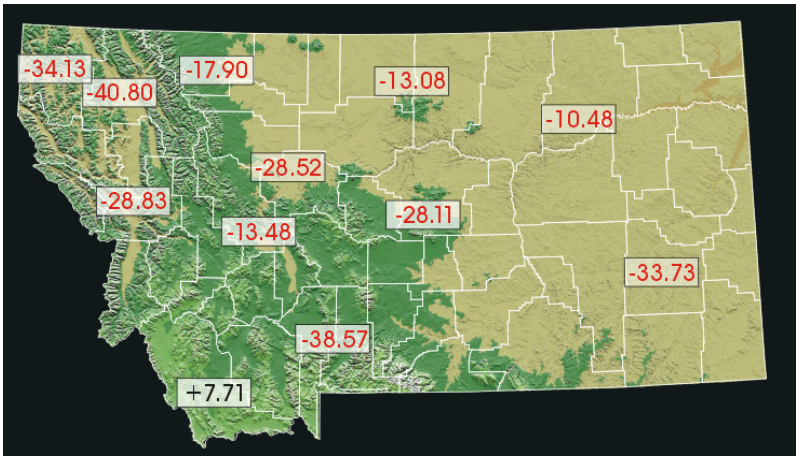
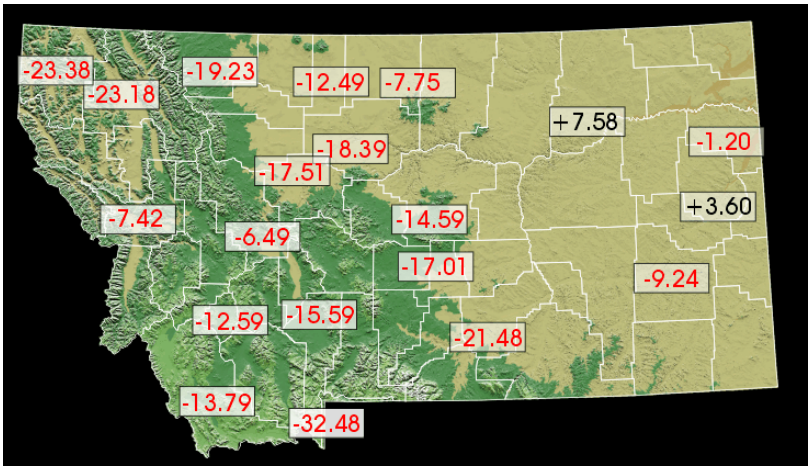


Figure 3.3.9-4 Precipitation anomalies 1999-2003
Source: NWS, 2004



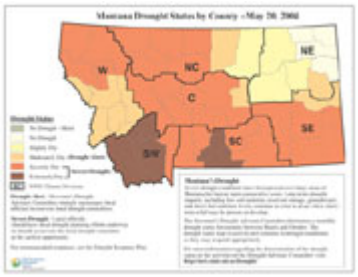
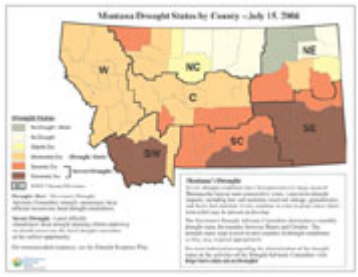
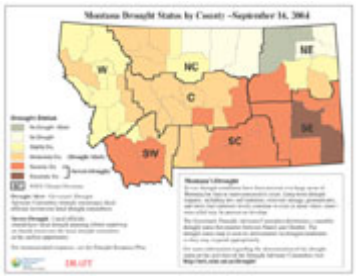
Montana drought conditions for May, July and September for the period 2004 through 2007 are shown in **Figure 3.3.9-5**.

3.3.9.3 Declared Disasters from Drought and Effects of Drought

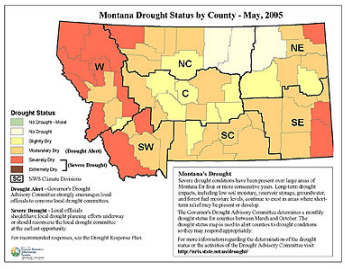
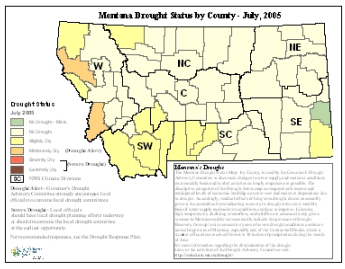
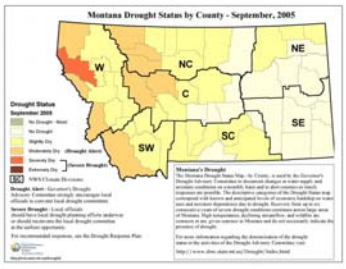
Drought disasters are unique; they typically do not require evacuations or constitute an imminent threat to life or property. As a result, disaster declarations and assistance are typically provided by agencies such as the USDA Farm Service Agency (FSA) and Small Business Administration (SBA). There have been no Presidential disaster declarations for drought, except for those related to wildland fires. The declarations at the federal level have been from the Secretary of Agriculture and are referred to as Natural Disaster Determinations (NDD). NDDs allow various assistance programs, such as the low-interest FSA Emergency Loans to Eligible Producers, and assistance through the Crop Disaster Program, Livestock Compensation Program, and Livestock Indemnity Program, among others. State disaster declarations and assistance were provided for grasshopper infestations, as shown in **Table 3.3.9-2**.

Figure 3.3.9-5 Montana Drought Status 2004 – 2007

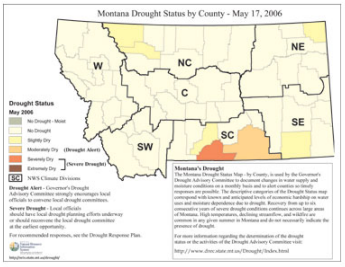
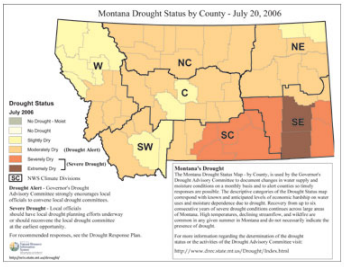
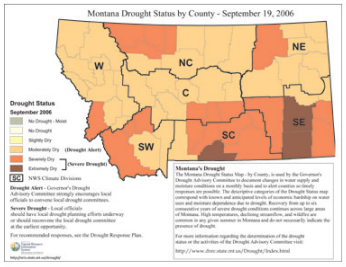
2004 Montana County Drought Status

May	July	September
		

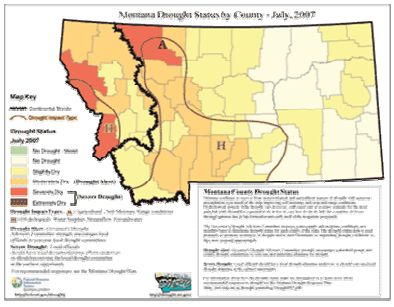
2005 Montana County Drought Status

May	July	September
		

2006 Montana County Drought Status

May	July	September
		

2007 Montana County Drought Status

May	July	September
		Fill in when available

Source: NRIS, 2007

Table 3.3.9-2 State Disaster Declarations from Grasshopper Infestations

Year	PA No.	Applicant	State	Local
1975	MT-1-75	Valley County	$59,562.00	$ -
1985	MT-85-2	Carter County	$12,912.62	$12,913.62
1985	MT-85-3	Judith Basin County	$15,770.00	$15,770.00
1985	MT-85-4	Pondera County	$43,480.00	$43,480.00
1985	MT-85-5	Prairie County	$11,704.18	$11,704.18
1985	MT-85-6	Sheridan County	$112,020.62	$112,021.62
1985	MT-85-7	Wibaux County	$19,507.89	$19,507.89
1986	MT-86-1	Carter County	$14,280.00	$14,280.00
1986	MT-86-2	Daniels County	$56,245.00	$56,245.00
1986	MT-86-3	Golden Valley County	$8,253.00	$8,253.00
1986	MT-86-4	Petroleum County	$9,842.00	$9,842.00
1986	MT-86-5	Richland County	$69,037.50	$69,037.50
1986	MT-86-6	Roosevelt County	$57,176.00	$57,176.00
1986	MT-86-7	Sheridan County	$100,152.50	$100,152.50
1986	MT-86-8	Treasure County	$12,733.00	$12,733.00
1986	MT-86-9	Wibaux County	$22,281.00	$22,281.00
TOTAL			**$624,957.31**	**$565,397.31**

Source: MDES, 2004.

Natural Disaster Determinations were made for drought in each year from 2000 through 2006. The NDDs were statewide, except for the determinations in 2003 through 2006, which identified specific counties and tribal nations. **Table 3.3.9-3** summarizes the 2006 Montana Natural Disaster Determinations.

Figure 3.3.9-3 2006 Montana Natural Disaster Determinations

County	Type of Disaster	Comments
Big Horn	Fire, drought, heat stress, hot winds, hail, insects and late freezing	
Blaine	Drought, excessive Heat, Fire danger, Strong winds and hail	Economic hardship
Broadwater	Drought	Economic hardship
Carbon	Drought	Loss of livestock, broken power poles, dikes and damaged dams, roads washed out
Carter	Spring snow storm, drought, excessive heat, strong wind	
Custer	Fires, high temperatures, drought	
Daniels	Drought, fire, hail, severe storms, heat, winds, spring frost & freezing temps in spring	
Dawson	Drought, hail, excessive heat, fire, severe storms, strong winds, tornado	Loss of livestock, broken power poles, dikes and damaged dams, roads washed out
Fallon	Spring snow storm	Economic hardship
Garfield	Drought	
Golden Valley	Drought, excessive heat, fire danger, strong winds	
Hill	Drought, extreme fire danger, severe storms, excessive heat, strong wind	
Phillips	Drought, extreme heat, burning wildfires, excessive wind, hail, lack of water for stock	

Figure 3.3.9-3 2006 Montana Natural Disaster Determinations

County	Type of Disaster	Comments
Powder River	Spring snow storm	Loss of livestock
	Fires, high temperatures, drought	100 months of drought out of 108 months
Prairie	Drought, fire, severe storms, exessive heat, strong winds	
Richland	drought, excessive heat, wildfires	
Rosebud	Drought, hail, grasshoppers, high winds, wildfire declarations	
Roosevelt	Drought, excessive heat, fire,	
Sheridan	Drought	
Stillwater	Drought, excessive heat, burning fires	
Sweetgrass	Drought, extreme heat, burning wildfires	
Teton	A decade of drought, excessive heat, hail, strong winds	
Valley	Drought, excessive heat, fire danger, strong winds	
Yellowstone	Prolonged drought, wildfire damages	

Source: Montana DNRC, 2007a

Table 3.3.9-4 shows the USDA Farm Service Agency payments by program for 2004 to 2007. It should be noted that the assistance paid in any given year is based on crop or grazing losses from two and three years prior.

Table 3.3.9-4 FSA Payments to Montana Agricultural Producers for Drought, FY 2004-2006 (Oct 1 through Sept 30)

USDA Farm Service Agency Program	Payments from USDA		
	2004	2005	2006
Emergency Conservation Program (ECP)	$506,030	$783,328	$235,611
Crop Year for Crop Disaster Program (CDP)	$22,799,583	$66,552,674	$2,396,012
American Indian Livestock Feed Program (AILFP)		$167,412	$2,667,049
Livestock Assistance Program (LAP)	$14,392,544	$3,874,895	$25,281,643
Non-insured Crop Disaster Program (NAP)	$2,771,610	$7,756,284	$529,087
Other Disaster Assistance Programs	$1,737,893	-	-
Total	**$42,207,660**	**$79,134,593**	**$31,109,402**

Source: USDA FSA, 2007

Drought has a profound effect on other contributors to the agricultural economy beyond producers. The Small Business Administration can make declarations to provide assistance to businesses that are directly related to agricultural production, such as implement dealers and agricultural suppliers. The SBA issued the following weather disaster declarations in recent years (US SBA, 2004; US SBA 2007):

- **SBA Declaration #9Y61 – Drought:** Small businesses in Beaverhead, Gallatin, Madison, and Ravalli Counties were eligible to apply for a low-interest Economic Injury Disaster Loan from the SBA. **Excessive Heat:** Small businesses in Mineral, Missoula, and Ravalli Counties were eligible to apply for a low-interest Economic Injury Disaster Loan from the SBA.

- **SBA Declaration #9Y72 – Drought:** Small businesses in the entire state were eligible to apply for a low-interest Economic Injury Disaster Loan from the SBA.

- **SBA Declaration #9Y79 for Flooding, Ground Saturation, Storms, Winds, Tornadoes, High Humidity, Dry Conditions, and Severe Temperatures**. Small businesses in Fallon, Richland, Roosevelt, Sheridan, and Wilbaux Counties were eligible to apply for a low-interest Economic Injury Disaster Loan from the SBA. These loans were available to small businesses dependent on farmers and ranchers that suffered financial losses that occurred starting April 1, 2003.

- **SBA Declaration #9Y53 for Extreme Heat, High Wind, Severe Storms, Prairie and Forest Fires and Below Normal Precipitation.** Small businesses in Carter and Fallon Counties were eligible to apply for a low-interest Economic Injury Disaster Loan from the SBA. These loans were available to small businesses dependent on farmers and ranchers that suffered financial losses that occurred starting January 1, 2003.

- **SBA Declaration #10086 - Drought:** Small business in Carbon, Gallatin and Park Counties were eligible to apply for a low-interest Economic Injury Disaster Loan from the SBA. These loans were available to small businesses dependent on farmers and ranchers that suffered financial losses in 2005.

3.3.9.4 Vulnerability to Drought and Effects of Drought

3.3.9.4.1 Statewide Vulnerability to Drought and Effects of Drought

Any place in the state can be considered vulnerable to drought. Weather cycles will dictate the availability of water and the extreme temperatures to exacerbate drought. Vulnerability is related to lack of preparedness. The ability to have adequate stores of water, to change to drought resistant crops, to implement conservation measures during extended dry periods, all help to reduce negative impacts. Vulnerability is increased when lessons learned during drought are ignored or forgotten following a return to normal weather patterns.

Since Montana's population and water usage is continuing to grow, demand for water is rising at a steady rate. Available supplies have also increased over the years through a variety of structural (dams) and non-structural (conservation) means, but the State's ability to create new levels of supply is marginal. In recent years, demands on water have been increasing faster than supplies, so that tolerance to deal with water shortages is diminishing. The balance between supply and demand is likely to be disrupted more and more often, and in the future, water shortages are likely to be more frequent and costly.

The most effective means to assess vulnerability from drought is to determine what areas are exposed economically to the effects of drought. Water shortages force conservation and water use restrictions, can reduce our recreation opportunities, and can increase the threat of wildland and rangeland fire. For many Montana residents, water shortages may impact sectors of our economy, but are seldom disastrous. The major exception is agriculture, and those who directly depend on the agricultural economy. Drought has the most profound impact on growing crops and providing enough feed for livestock.

Counties that have a high dependence on agriculture are reflected in the percentage of personal farm income to total personal income. These counties may be more vulnerable to drought. **Table 3.3.9-5** shows the ten counties that have the highest percentage of farm income to personal income as measured in 2003. The table also shows that some counties recovered somewhat from drought in 2004 and 2005 through the increase of farm personal income, while in other counties the impact of drought is still apparent through the decrease of farm personal income.

Table 3.3.9-5 Total Personal and Farm Income by County (2003-2005)

County	2003			2004			2005		
	Personal ($,000)	Farm ($,000)	%	Personal ($,000)	Farm ($,000)	%	Personal ($,000)	Farm ($,000)	%
Liberty	$51,744	$11,616	22.45%	$50,116	$9,215	18.39%	$52,068	$10,787	20.72%
Petroleum	$9,854	$2,196	22.29%	$9,909	$1,959	19.77%	$10,191	$1,963	19.26%
Garfield	$32,649	$6,681	20.46%	$32,169	$6,206	19.29%	$36,455	$9,626	26.41%
Prairie	$30,423	$5,685	18.69%	$30,219	$5,629	18.63%	$31,903	$6,191	19.41%
Chouteau	$138,608	$22,913	16.53%	$149,648	$27,480	18.36%	$150,859	$26,881	17.82%
Wibaux	$22,590	$3,043	13.47%	$22,086	$1,710	28.10%	$24,300	$3,811	26.41%
McCone	$40,584	$5,442	13.41%	$43,317	$6,171	14.25%	$44,797	$6,791	15.16%
Sheridan	$104,549	$13,488	12.90%	$107,980	$15,427	14.29%	$103,305	$9,922	9.60%
Daniels	$52,415	$6,315	12.05%	$54,626	$8,348	15.28%	$53,570	$6,564	12.25%
Meagher	$45,505	$4,652	10.22%	$47,622	$6,581	13.82%	$48,603	$6,918	14.23%
Montana	$24,177,191	$346,030	1.43%	$25,790,606	$480,005	1.86%	$27,121,828	$452,983	1.67%

Source: USDC BEA, 2007

3.3.9.4.2 Review of Potential Losses in Local PDM Plans

Figure 3.3.9-6 presents the Drought Hazard Risk Map. The colors represent a high-medium-low risk rating based on information in the Local PDM Plans. The gray color indicates this hazard was not assessed in the Local Plan. The hatch pattern indicates the Local Plans were not available for review. For electronic users of the State Plan, clicking on a county or tribal reservation will take you to the Local Plan where further information is available.

Table 3.3.9-6 presents a summary of potential loss estimates due to drought as calculated in the Local PDM Plans. Drought loss is described in terms of its effect on buildings, society and the economy, where generally:

- Building loss is presented either as a dollar value or a high-moderate-low rating and typically refers to the potential loss to critical facilities in the jurisdiction.
- Societal loss is presented either as the number of lives at risk or as a high-moderate-low rating representing the potential for loss of human life.
- Economic risk is presented as a dollar value or high-moderate-low rating referring to the potential impact to the economy of the local jurisdiction.

References cited in **Table 3.3.9-6** correspond to a description of the method used to calculate potential loss that can be found in *Section 7.14.*

3.3.9.4.3 Vulnerability of State Property

Drought disasters impact economies and can threaten timber reserves, through wildland fires and other environmental impacts. State property that could be vulnerable to drought includes leased cropland and state forest property. Leased cropland and grazing leases return approximately $16.8 million annually to the state. Timber production from state-owned timber tracts returned $13 million in FY 2006 (Montana DNRC, 2007b). The exposure of leased cropland and timber lands is low, as the return from these properties is relatively small.

State-owned facilities are not considered to be vulnerable to drought.

Figure 3.3.9-6 Hazard Risk Map: Drought

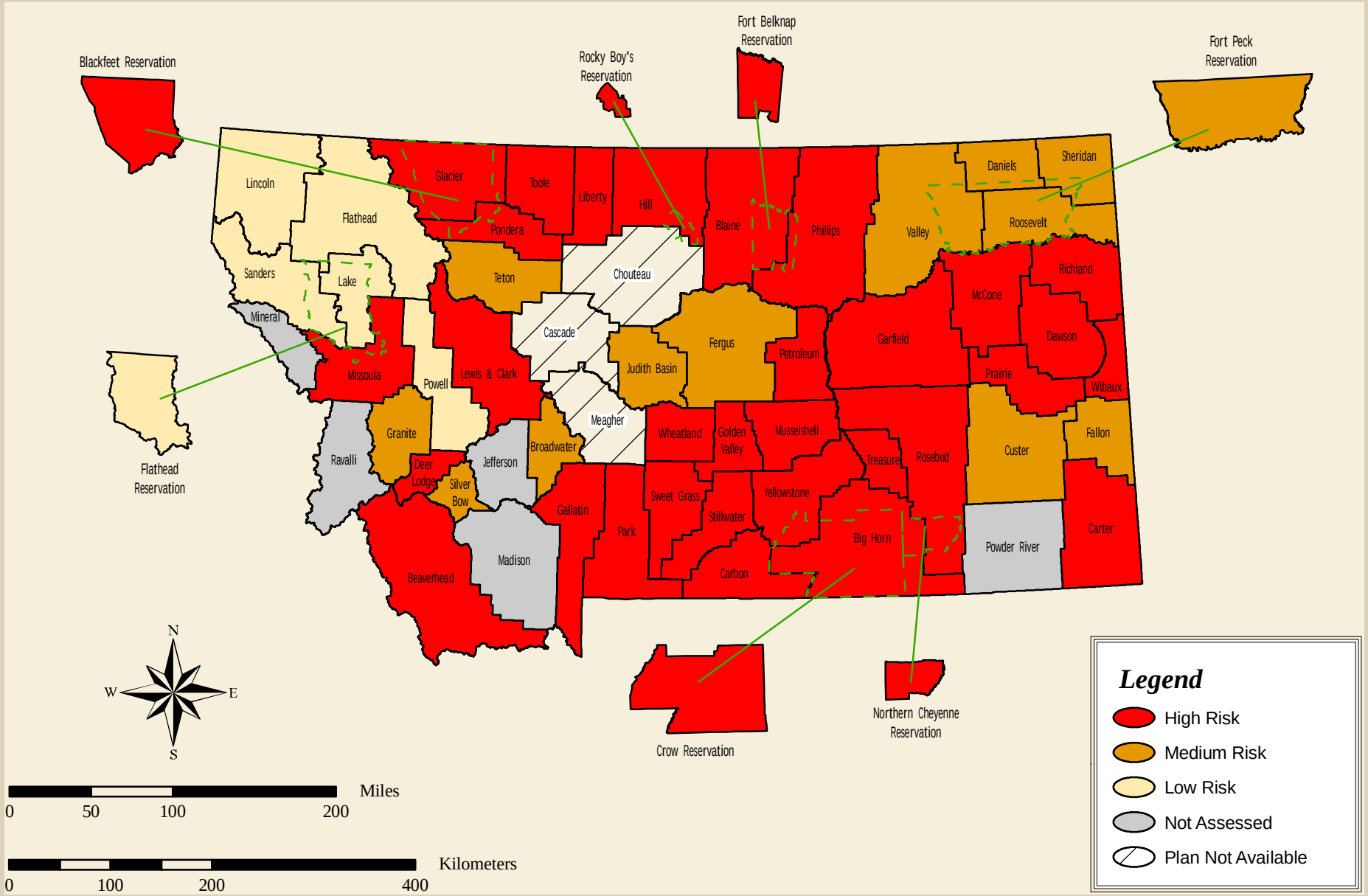


Table 3.3.9-6 Potential Losses from Local Plans: Drought

DES District	Jurisdiction	Building Loss	Societal Loss	Economic Loss	Reference
1	Deer Lodge County	Low	Low	High	1
1	Flathead County	Low	Low	Moderate	8
1	Flathead Reservation	NA	NA	NA	
1	Granite County	Low	Low	High	1
1	Lake County	NA	NA	NA	
1	Lincoln County	NA	NA	NA	
1	Mineral County	NA	NA	NA	
1	Missoula County	NA	NA	NA	
1	Powell County	Medium	Low	NA	10
1	Ravalli County	NA	NA	NA	
1	Sanders County	NA	NA	NA	
1	Silver Bow County	Low	Low	Moderate-High	1
2	Blackfeet Reservation	NA	NA	NA	
2	Blaine County	NA	NA	NA	
2	Cascade County	U	U	U	
2	Chouteau County	U	U	U	
2	Fort Belknap Reservation	NA	NA	NA	
2	Glacier County	NA	NA	NA	
2	Hill County	NA	NA	NA	
2	Liberty County	NA	High	Very High	11
2	Pondera County	NA	NA	NA	
2	Rocky Boy's Reservation	NA	NA	NA	
2	Teton County	NA	NA	NA	
2	Toole County	NA	High	Very High	11
3	Beaverhead County	$0	5,153	NA	5
3	Broadwater County	Low	Low	High	1
3	Gallatin County	Low	Low	High	12
3	Jefferson County	NA	NA	NA	
3	Lewis & Clark County	NA	NA	NA	
3	Madison County	NA	NA	NA	
3	Meagher County	U	U	U	
3	Park County	Low	Low	High	1
3	Sweet Grass County	NA	NA	NA	
4	Carter County	High	Low	High	12
4	Custer County	NA	NA	$8 million	13
4	Dawson County	NA	NA	$23,631,510	8
4	Fallon County	NA	NA	$6 million	8
4	Garfield County	Low	Low	Millions	1
4	McCone County	NA	NA	Millions	3
4	Powder River County	Low	Low	Millions	1
4	Prairie County	NA	NA	$1,638,705	3
4	Richland County	NA	NA	$5,668,613	3
4	Wibaux County	NA	NA	$1,361,113	3
5	Big Horn County	Low	Moderate	$10,000,000	3
5	Carbon County	NA	NA	NA	

Table 3.3.9-6 Potential Losses from Local Plans: Drought

DES District	Jurisdiction	Building Loss	Societal Loss	Economic Loss	Reference
5	Crow Reservation	NA	High	$10,000,000	3
5	Golden Valley County	NA	NA	NA	
5	Musselshell County	NA	NA	NA	
5	Northern Cheyenne Reservation	None	Moderate	Millions	3
5	Rosebud County	Low	Low	High	1
5	Stillwater County	NA	NA	NA	
5	Treasure County	Low	Moderate	High	1
5	Wheatland County	NA	NA	NA	
5	Yellowstone County	NA	NA	NA	
6	Daniels County	NA	NA	NA	
6	Fergus County	NA	2	4	4
6	Fort Peck Reservation	NA	NA	NA	
6	Judith Basin County	NA	NA	NA	
6	Petroleum County	NA	NA	NA	
6	Phillips County	NA	NA	NA	
6	Roosevelt County	NA	NA	NA	
6	Sheridan County	NA	NA	NA	
6	Valley County	NA	NA	NA	

Notes: U = Local PDM Plan not available for review; NA = not assessed in Local PDM Plan
Potential loss was computed was not computed in a uniform manner in Local PDM Plans. See number references in *Section 7.14* for a description of the methods used to calculate potential building, society and economic loss.

3.3.9.5 Impact of Future Development

The impact of future development on the drought hazard would be through limiting groundwater resources. Since the Montana Department of Environmental Quality carefully monitors and regulates public water systems, individual wells and septic systems, the impact of future development with respect to drought is considered low.

3.3.9.6 Drought and Effects of Drought Data Limitations

Historic information on USDA FSA payments for drought was not available, except for year 2003. This historical information is critical to determine the locations most affected by drought. The effects and time frames of drought are very subtle and sometimes are masked by other economic and weather conditions. Continued documentation of losses attributed to drought will allow more specificity in the hazard assessment.

3.3.9.7 Drought and Effects of Drought References

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